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(A Chat on Science)

THE BODY GUARD

By Edwin E. Slosson

That mankind has not given up hope of the discovery of an "elixir of life", in spite of the disappointments of a thousand years or more, was shown by the headlines of the papers on November 15 after Dr. Alexis Carrel had read a paper before the National Academy of Sciences at the Rockefeller Institute on "Leucocytic Secretions". The title was not engaging but everybody knew that whatever Dr. Carrel said would be worth hearing, and when he told of the way certain fluids from the white blood corpuscles revivified dormant cells and promoted the growth of the tissues of the body, some reporters jumped at the conclusion that the fountain of immortal youth was at last in sight. Dr. Carrel was far from making any such rash promises but he did report a very interesting extension of our knowledge of the restorative processes of the body from which we may fairly expect in time some beneficial applications.

Dr. Carrel has been able to carry on the study of such processes farther than before because he found a way of working with living cells outside the body. Ten years ago he picked out a tiny bit of the heart of an unhatched chicken and has kept it alive on glass in a warm place ever since by feeding it with suitable nutritive solutions and washing away the waste products. Now the chicken, if it had been allowed to hatch, would likely have died five years ago, but this particular bit of its heart muscle, having been better cared for by Dr. Carrel than it could have been by the chicken, is not only living and growing, but seems as young as ever and there is no apparent reason why it should not continue on indefinitely, although the matter that composes it has changed more than a thousand times. Dr. Carrel has also found that the white cells of the blood can likewise be worked with outside the body. They can be cultivated on mica plates like colonies of bacteria and their influence on other cells studied at will in the laboratory. This indeed is not so surprising as his previous cultivation of a piece of muscle for these white blood cells lead a somewhat independent life even while they are in the body.

Anyone who has looked at blood through a microscope will have noticed that there are two kinds of bodies floating in the fluid. There are first rolls of little round red disks looking like checker men. They carry around in a mechanical sort of way the oxygen received from the air in the lungs. But mingled with them in the blood stream are a few bodies of a different and more active sort. They are

colorless and larger than the red corpuscles and have no definite shape, but adapt themselves to their situation, crawling through crevices in the capillaries and wandering about freely among the tissues. Instead of being limited as to legs and arms as we are they stick out any kind of a limb anywhere they may happen to need it at the moment like the simplest of independent animals, the amoeba.

The great Russian physician, Metchnikoff, discovered that these white blood corpuscles - or leucocytes, to give them their Greek name - served a useful purpose in eating up the microbes that invade our bodily citadel. In case of a wound they rush to the spot in increasing numbers and pile up their bodies in the breach of the skin wall. Every leucocyte is as heroic as Arnold von Winkelried. Wherever there is infection there these defenders may be found fighting the foe and perishing by the thousand in the attempt.

But now Dr. Carrel has found that they do much more than attack disease germs. They also in some way stimulate the structural cells of the body to greater exertions and promote the reconstruction of damaged tissue. They aid in the healing of wounds and the rebuilding of bones. They secrete an activating substance of some sort that revives the energies of cells that have grown tired or old. In short they act not only as a patrol force to discover and combat microbic enemies but they further see to it that the other cells do their duty. No wonder that physicians have found that an examination of the blood to determine the number and activity of the leucocytes is one of the best ways of finding out what chance a patient has of overcoming his disease.

COMBINED DYES KILL BACTERIA

"Dyebacteria and they die" is one way of expressing a discovery that Prof. John W. Churchman, of Yale University and surgeon-in-chief of the New Haven Hospital, has reported to the National Academy of Sciences.

"Different kinds of aniline dyes have high bactericidal power," Dr. Churchman said. "By mixing two kinds of dyes of opposite selective power a mixture results that readily kills all bacteria. The two dyes may be used together in a mixture of this kind and the strength of one fortifies the weakness of the other. This establishes a new principle in dye therapeutics".

In 1912 Dr. Churchman discovered that the dye, called gentian violet, kills certain kinds of bacteria even when it is as weak as one part in a million. This fact was applied in treating many kinds of infections.

Now Dr. Churchman has announced the finding of another aniline dye, acid fuchsin, which kills the bacteria which the gentian violet spares and spares those which the gentian violet kills. The mixture of the two dyes, which has a royal purple color, spares none of the bacteria.

"Contrary to what is usually held, dyes may be effective against bacteria even though they do not stain them," he said. "Bacteria may also be stained by dyes without injury."

He has shown, moreover, that the mechanism by which dyes "kill" bacteria depends not on their ability really to kill them, but to paralyze their reproductive capacity.

HOW CHILEAN QUAKE HAPPENED

How Chile's death-dealing earthquake, which shattered cities and engulfed their helpless inhabitants with tremendous tidal waves, originated at sea off the coast of that country, was explained by Dr. W. J. Humphryes, meteorological physicist of the U. S. Weather Bureau, from the seismographic records made by the earth's tremors. For four hours the pen of the highly sensitive instrument drew the picture of the movements in the earth, which wrought such havoc among the Chilean towns in a few minutes.

Earthquakes, Dr. Humphreys said, are produced by a slipping or breaking of the crust of the earth as a result of strains. These strains may be caused by the shrinking of the interior of the earth through temperature changes, changes in loads due to rapid erosion taking material from one place to another in the course of a few hundred years, or from the tendency of higher land to flow out to sea.

From what is known of the present quake, it seems to have been caused by higher land moving out to sea. The actual break in the crust occurred at some distance from shore and this sudden change in the ocean floor at that point produced a tidal wave. As there were several such waves, there must have been several slips in the breaks in the earth's crust at the sea bottom which created the different huge billows in the incompressible water. It is probable that this crack extended for a hundred miles or more and that the wavecreated was detected in the Phillippines or other distant Pacific points.

Breaks, such as caused the shocks and waves in Chile, have left their mark on the physical geography of our own country. For instance there is a break in the earth's crust which can be seen at Great Falls, Va., near Washington. It has been traced from near Boston, Mass. through Pennsylvania and New York to the James River in southern Virginia. The Hudson River valley was created in the distant past by a similar slipping in the earth's crust.

An earthquake may occur anywhere on the earth's surface and no place is immune, yet they are most likely to happen at the present time in the newly formed geological regions such as are found along the western coast of South America, our own western coast, up to Alaska and down the other side of the Pacific by way of Japan, the Philippines, Java, and other islands in the South Pacific.

Because an earthquake occurs in one place is no indication that it will be followed by another in some other quakey regions. They do not run in series, unless the changes made in the load at one point may be so great as to cause additional strain at another place sufficient to cause a break. There are sometimes more shivers in the vicinity of an original break caused by further settling of the tremendous masses of rocks.

DID SPOT ON SUN CAUSE SLIP ON EARTH?

The spot that appeared on the sun Saturday, November 11, had little to do with the Chilean earthquake in the opinion of scientists. The fact that the earth shock coincided with the passage of the spot over the central meridian of the sun was merely a chance occurrence, according to leading seismologists and astronomers.

Experts at the U. S. Naval Observatory verified the fact that a sun spot became visible at the time of the quake but they also point out that now is a time of relatively few sunspots. Disturbances on the sun's surface which can be seen as dark

patches through the telescope seem to rise from a minimum through a maximum back to another minimum in a period of about eleven and a half years which is almost identical with that of the orbital revolution of the planet Jupiter.

But the relation that sun spots bear to movements of the earth's crust has been seriously investigated by scientists using the data of past earthquakes that have been recorded.

Dr. Ellsworth Huntington, of Yale University, recently published compilations showing a comparison of destructive earthquakes with sunspots during the past century. He concludes: "There is high probability that directly or indirectly sunspots and earthquakes are somehow connected".

The same data led him to say that "a world shaking earthquake in one region during a given month probably creates conditions that favor similar earthquakes elsewhere during the next month.

NO SCIENTIFIC BASIS FOR PREDICTING CALIFORNIA QUAKE

The fact that the earthquake zone in California is analogous geologically to the devastated region in Chile has raised some apprehension as to the probability of a quake or tidal wave in California.

Since the disaster of 1906, considerable scientific research on the causes of the crust movements on the West Coast has been conducted which may eventually lead to definite earthquake predictions.

But Dr. H. O. Wood, in charge of investigations for the Carnegie Institution of Washington at the Mount Wilson Observatory, says:

"There is no scientific basis for any estimate of a probability of an earthquake in California following upon the recent shock in Chile. No indications of any impending shock have been noted here. Sometimes several great earthquakes have occurred in places far distant from one another within a relatively short time interval so as to suggest casual group occurrence but more commonly there is no such apparent grouping in the occurrence of great shocks."

About 150 miles off the coast of California, there is a sharp break in the ocean bottom that is as steep as the east slope of the Sierra Nevadas, according to Dr. William E. Ritter, director of the Scripps Institution for Biological Research, who located it by extensive soundings when he was on the oceanographic expedition of the "Albatross" in 1904. It has been suggested that this is a plane of weakness that might give rise to an earthquake at sea. Such a crustal slip would probably create a serious tidal wave such as that which swept the Chilean coast in the wake of the recent shocks.

But investigations into the history and folklore of the country are reassuring. They indicate that no tidal wave ever swept the California coast, according to Dr. Ritter. There is not even a tradition of sudden encroachment of the sea

upon the land.

READING REFERENCE- Alter, D. Possible connection between sunspots and earthquakes. Science n.s. 51:486-7 May 14, 1920. California Univ. of. Publications. Bulletin of the seismographic stations. Berkeley Univ. of Calif. press. Pan-American scientific Congress. 2d. Wash. D.C. Astronomy, meteorology, and seismology. Wash. Govt. printing office. 1917. Hobbs, W. H. Earthquakes. Appleton, 1907. Houston, E. J. Wonderbook of Volcanoes and Earthquakes, Stokes, 1907.

PLAN SCIENTIFIC STUDY OF HUMAN MIGRATION

Scientists and administrators interested in immigration met November 18, at the National Research Council in Washington to formulate initial plans for research into the complex problems that arise through human migration.

The committee of the council planning this undertaking believes that it should involve thorough consideration of the psychological, anthropological, economic, sociological, medical and administrative phases of the subject.

The conference was presided over by Dr. John C. Merriam, president of the Carnegie Institution of Washington. Other speakers included: Thomas N. Carver, professor of economics, Harvard University; William McDougall, professor of psychology, Harvard University; Dr. J. W. Kerr, assistant surgeon general, U. S. Public Health Service; Dr. H. H. Laughlin of the Eugenics Record Office of Cold Spring Harbor, N.Y.; Dr. Frankwood E. Williams, medical director of the National Mental Hygiene Committee, New York; and Miss Kate H. Claghorn of the New York School of Social Work.

Methods of measuring traits of intellect, temperament and character will probably be developed or adapted in the proposed research work, Dr. Robert M. Yerkes, chairman of the committee calling the conference, explains. Then these methods will be applied to racial or geographical groups in order to discover significant race differences and to evaluate them. The proposed work is designed ultimately to aid in forming a scientific basis for regulating the settlements and movements of peoples.

READING REFERENCE- Migration of the races. Round Table 11:241-73. March, 1921.

Saturn is the lightest of all the planets, its density is only sixty-three hundredths that of water.

The U. S. Bureau of Fisheries recently deposited 1500 drift bottles in the waters along the north Atlantic coast in an effort to get data in regard to ocean currents to be used in studying the movement of fishes.

There are always at least two eclipses of the sun every year and there may be as many as five.

ASTRONOMICAL PROGRESS TOO RAPID TO ALLOW BOOKS

Declaring that "the brilliant and penetrating insight of Dr. Henry Norris Russell of Princeton University has led in recent years to a development of astronomy so rapid that it has proved thus far impossible to publish really up-to-date text books on the subject", the National Academy of Sciences presented him with the Henry Draper medal at its recent dinner in New York.

"Before the manuscript of a text on astronomy can be prepared, much less carried through the press, new knowledge renders the treatment stale," explained Dr. C. G. Abbot, secretary, in making the presentation.

Dr. Russell has made basic contributions to the great problem of stellar evolution, the report of the awarding committee said in explaining that he saw clearly that the brightness of a star as we see it depends on several factors.

"There is the intrinsic brightness of the star as a source of light," Dr. Abbot explained. "What the tallow candle is to the electric arc, so one star may be to another in the brightness of its shining surface.

"Secondly, the total amount of light which a star sends out depends upon its diameter. Quite recently it has been shown, for instance, that the star Alpha Orionis is three hundred times the diameter of the sun, and accordingly its cross-sectional area is ninety thousand times the cross-sectional area of the sun. Hence, if they were of equal surface brightness, the star Alpha Orionis would send out ninety thousand times as much light as the sun.

"In the third place, the brightness of the star depends upon its distance from the earth and falls off as the square of that distance. Thus, the sun, which is so near that it takes light eight minutes to come from it, being about two hundred thousand times as near as the next nearest star which takes light three or four years to reach the earth will appear forty million times brighter on that account.

"With these conditions in mind, Dr. Russell, in collaboration with Dr. Hinks of England, began by the application of a new photographic method of determining the distance of stars, and in 1910 published the results showing the approximate distance of 55 stars. With this and other such information which had been laboriously acquired by others, he was able to show that the red stars evidently must fall into two classes: One class sending out very much more light than our sun, and another sending out very much less, and that between these two very widely separated extremes there are no red stars intervening.

"Going on, he applied the, until then little used, knowledge of the eclipsing variable stars with the most penetrating theoretical ability. For many years, measurements have been going on at Harvard Observatory and elsewhere on the march of brightness of such stars as Algol, in which we see a pair of objects which in their rotation about their common center of gravity periodically eclipse each other. Dr. Russell showed how the elements of the eclipse, comprising the observed brightness and the corresponding times, could be treated in order to give probable relative values of the densities of stars in the different eclipsing systems, and with his pupil and collaborator, Dr. Shapley, who applied Russell's methods, the results for 87 stars were obtained and published in 1913.

"In the meanwhile, many additional stars had been measured for distance from the earth, and by combining the information then available, Russell showed in 1913 that the stars may be divided into two extraordinary sequences which, following

Hertzsprung, he called the 'giants and dwarfs'.

"In short, the 'giants' beginning with the red and going on to the yellow, white and blue, form a series of substantially equal output of light far in excess of that which is expended by our sun, and their densities, beginning with the red stars which are so rare that the material of which they are composed is more to be compared to a fairly high vacuum than to ordinary gaseous, liquid, or solid densities, increase as the sequence goes on until with the blue stars the density has become much more considerable.

"From this point the descending series of the dwarfs begins, and the density reaches in our yellow sun about one and one-half times that of water and from this goes on to the very red and small stars who density is as great or greater than that of the earth itself.

"So regular is the light progress of this fascinating series of dwarf stars that if one merely observes the type of spectrum which one of its members possesses he can tell with reasonable limits the total amount of light which is emitted and therefore, in connection with its apparent brightness, can determine the probable distance away from the earth in space.

"On the other hand, if a cluster, such, for instance, as the great cluster in Hercules which are known to be stars of substantially equal distance from the earth, contains a group of stars of approximately equal brightness ranging through all the types of spectrum from the blue to the red, it follows that they are all giants and therefore emitting light of a roughly known quantity thousands of times in excess of that emitted by the sun, and from this the distance of the cluster can be fairly well estimated. Such considerations have been pursued by Dr. Shapley in regard to a great many of the clusters of stars, and have led him to assign distances in the stellar system some tenfold in excess of those which have been generally assumed before.

INSECT FROM JAPAN IMPERILS FRUIT CROP

Scientists, government officials, fruit growers, and nurserymen met in Washington recently to discuss means of checking the latest Japanese invasion to gain a foothold in this country. The camphor scale, a newly discovered crop insect pest, is spreading rapidly among camphor, satsuma orange, olive, privet, Japanese persimmon, fig, plum, and pecan trees in Louisiana and Alabama. Drastic measures to prevent the spread into other States were suggested as the experts gathered.

This insect has been traced to an importation of satsuma orange trees direct from Japan just before the plant quarantine barriers were put up in 1911-12. This scale has been classed as a menace with the Japanese beetle, the European corn-borer and the pink boll worm which gained a footing about the same time.

A federal quarantine on the two states invaded to protect the other citrus-growing regions of the country from attack by prohibiting the movement of nursery-stock and other articles likely to carry the pest is being considered.

Twelve thousand pounds of first class letter mail is advanced three or four hours each day by the Post Office Department transcontinental airplane relays.

DISCOVER HOW TO TRANSMIT ENCEPHALITIS FROM MAN TO RABBIT

Dr. Simon Flexner, of the Rockefeller Institute for Medical Research, New York, announced recently that he has discovered that the clear contents of ordinary cold sores on lips and nose will produce similar eruptions when inoculated in rabbits and that a proportion of such inoculated rabbits develop the nervous effects and symptoms of encephalitis or inflammation of the brain.

"This detection of potency for rabbits of the contents of the herpes eruptions," said Dr. Flexner in reporting his work to the National Academy of Sciences," has opened up a new and wide field of exploration into the nature of such serious diseases in man as lethargic or epidemic encephalitis, erroneously called sleeping sickness. It will throw light on still other forms of inflammation of the brain that lead sometimes to lasting defects, the source and character of which are now very obscure."

"The inflammation or encephalitis may be induced by direct introduction of the contents of the herpes vesicles into the brain of rabbits," he explained. "However induced, the transmission can be carried on in indefinite series. Moreover the symptoms attending the experimental disease are characteristic in general, while varying individually according to the particular area or part of the brain specially attacked by the active agent. The herpes virus, as the active agent is called, is doubtless of microbic nature.

"Ordinary bacteria are entirely absent from this active material when carefully collected from the herpes vesicles, which when occurring on lips and nose are often spoken of as cold sores, and properly transferred to the brain of rabbits. Other animals are also subject to inoculation in less degree, among them guinea pigs and rats."

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Encephalitis lethargica, an infectious disease of the central nervous system, commonly called "sleeping sickness" although it has no relation to the African disease of the same common name, first appeared in epidemic form in recent years in Austria in the winter of 1916. It was described and named in 1917. It reappeared the following winter and was first recorded in England in April, 1918, and in the United States in March, 1919. Its common name comes from the fact that the victim shows lethargy and drowsiness, and the disease is also recognized by the occurrence of double vision, due to paralysis of the muscle of the eye. The mortality of the disease is about 20 per cent, and deaths usually occur within three weeks from the onset. Often the illness may continue for weeks and even months. The disease has been hard to treat due to lack of knowledge about its cause and transmission.

ANTISERUM FOR ROCKY MOUNTAIN SPOTTED FEVER PRODUCED

A serum for combating the highly fatal malady, Rocky Mountain spotted fever, has been produced in the laboratories of the Rockefeller Institute for Medical Research, Dr. Hideyo Noguchi, has announced to the National Academy of Sciences.

"We have been able to produce a serum the strength of which is such that the injection of one-tenth of a cubic centimeter suffices to prevent or abort the disease in guinea pigs when the injection is made from one to four, and sometimes as long as six, days after the inoculation of the virus," said Dr. Noguchi, who is already famous because of his isolation and cultivation of micro-organisms causing

yellow fever, his development of preventive vaccine and curative serum for yellow fever, and other medical work.

"Since in human beings the fact of a bite by a wood tick is usually discovered several days before the onset of the fever and other symptoms of the fatal disease," he explains, "it is hoped that the injection of the serum in approximately the same proportion, 15 centimeters for a man of 150 pounds, may succeed in averting or aborting and thus bringing to a favorable issue the impending malady."

Rocky Mountain spotted fever, a highly fatal malady, is transmitted to human beings through the bite of a wood tick infesting the woods and pastures in parts of Montana, Wyoming, and Idaho, Dr. Noguchi explained. The disease reaches in certain places and at certain times a mortality of 70 to 80 per cent. Farmers, herdsmen, lumbermen, and sportsmen are thus especially attacked.

The micro-organism responsible for the disease goes by the name of the virus or Rocky Mountain spotted fever and is believed to belong to the class of parasites called Rickettsia, which includes also the virus inciting typhus fever, another insect-borne (lice) disease of man.

"Rocky Mountain spotted fever, like typhus fever, can be communicated by inoculation to guinea pigs, which develop symptoms comparable to those occurring in man, show organic changes resembling those in man, and succumb as a rule to the infection induced," he said. "These animals therefore constitute a favorable test material for an antiserum, which may also be effective in man."

"Rabbits, on the other hand, tend to withstand the experimental infection. While the mortality in inoculated guinea pigs is 80 to 100 per cent, that in rabbits is about 20 per cent. For this reason, and because the guinea pig is too small, and horses have given unsatisfactory results, we have employed the rabbit in which to prepare an antiserum."

FORMER ENEMIES NOT EXCLUDED FROM INTERNATIONAL RESEARCH

Denial of a rumor spreading through this country that the International Research Council, the world organization of science, took action at its Brussels meeting last July excluding Germans and Austrians from its meetings and those of the international affiliated unions for twelve years was made by Dr. Vernon Kellogg, permanent secretary of the National Research Council, which represents the international organization in America.

"No such action was proposed or taken," said Dr. Kellogg. "No German or Austrian organizations have as yet been admitted to the International Research Council but their admission is probably a matter of the near future".

A single grain of indigo will color a ton of water.

There are olive trees still living that have been yielding crops for centuries.

Almost every stenographer in Australia uses an American typewriter.

TABLOID BOOK REVIEW

YEARBOOK 1921 of the United States Department of Agriculture. Government Printing Office, Washington.

Instead of the collection of relatively short reports on the more scientific work of the federal agricultural department, this year's summary is devoted largely to comprehensive economic treatments of America's four principal agricultural products: wheat, corn, beef, and cotton. There is also a review of the year in agriculture by Secretary Wallace, and an illuminating graphic summary of American agriculture.

EASTER ISLAND HOLDS ETHNOLOGIC MYSTERY

Has the evidence of one of the greatest ethnological mysteries on earth been effaced forever, was the question asked when unconfirmed rumors told that Easter Island, 2,000 miles off the coast of Chile and belonging to that country, had disappeared since the Chilean earthquake.

This little island, only 29 miles in circumference and 1,700 feet high, is volcanic in origin and contains several craters. It has puzzled scholars since its discovery on Easter morning, 1722. Here are found wonderful hieroglyphics which can not be read and strange gigantic statues hewn out of lava. The great number and size of these monuments suggests a more numerous people than could exist on the less than fifty square miles of rugged surface of the island as known to modern geographers.

Where these strange people came from and how they reached this little island, which is one of the most isolated parts of the world, is more or less of a mystery. These people probably came from Asia by boat and are of a Polynesian race related to the Sandwich islanders. Some scientists think, however, that this lonely spot. whose people today do not know whence they came, was not merely an outpost of Asia but that it represents a connecting link between the new and the old world, and that others of their fellows swept on to Central America and Peru. There is little evidence to confirm such a view and these peculiar monuments are an unsolved puzzle.

Geographers here describe Easter Island as one of the most isolated places on earth. It is inhabited by only about 250 natives and one English manager.

Well authenticated cases of the disappearance of volcanic islands beneath the sea have occurred even at the time of no earthquake. There is a record that an island rose out of the ocean off the coast of Trinidad several years ago. It stayed there for three months and then disappeared. On account of the large size and height of Easter Island, scientists here generally view its rumored disappearance with some skepticism.

Elephants, mastodons, and rhinoceroses ranged over practically all of what is now the United States in the geological past.

The ninth moon of Jupiter is more than fifteen million miles from its parent planet.

Dragon flies have been observed to destroy adult mosquitoes.
